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Applying Event-Related Potentials to Measure Consumer Preferences for Apparel Products

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Keywords: EEG, event-related potentials, preference, cognitive process

Consumers often develop positive or pleasurable feelings toward apparel products instantly after they see them even though they may not describe their subconscious cognitive process. It is necessary to understand consumers' non-conscious responses driving instinctive, emotional, and irrational consumer behavior. Human brain instantly and subconsciously processes information during consumer exposure to marketing stimuli such as products or advertisements. The electrical activity of the brain (EEG) or its temporal reaction (from one millisecond to 1,000 milliseconds) to stimuli can be measured in event-related potential (ERPs) experiments. Using ERPs is a direct, non-invasive technique to explore non-conscious cognitive process. By analyzing ERP waveforms generated by sensory and cognitive processing of external stimuli, the researchers attempted to observe how consumers respond emotionally to apparel products and to explain why they responded as they did. In this research, ERPs were applied to explore consumers' subconscious, real-time emotional responses to apparel products.

An ERP component as one of the more complex ERP waveforms is identified and analyzed by its polarity (positive or negative-going voltage), timing, scalp distribution, and sensitivity to task manipulation. An averaged time-locked ERP waveform (ERP component) helps visualize cognitive process as it takes place (Woodman, 2010). ERPs occurring the first 300 milliseconds (ms) after stimulus onset tend to reflect early sensory encoding of emotionally significant stimuli likely producing more enhanced emotional responses, which can be reflected in the later ERP components (P3 and LPP). (Pozharliev, Verbeke, Strien, & Bagozzi, 2015). The P3 component is a positive-going waveform within the 250-450 ms latency range. Guo and Zhang (2016) found that the recommendation from high familiarity individuals induced the largest amplitude of P3 suggesting that P3 reflects consumers' propensity to purchase recommended products during shopping online. The late positive potential (LPP) is a long-lasting, positive slow wave in the range of 500-700 ms after stimulus onset. Cuthbert, Schupp, Bradley, Birbaumer, and Lang (2000) reported that more affectively intense pictures generated more enhanced LPP than lower arousal pictures. Therefore, the following hypothesis was generated:

Viewing more favored shirts compared with less favored shirts will significantly increase ERP amplitude for P3 and LPP.

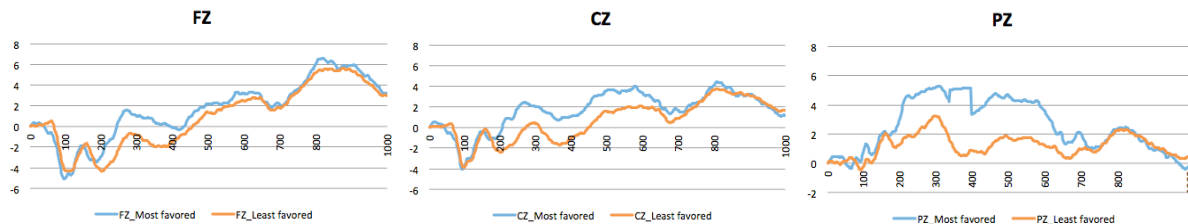
An online survey was administered to college students majoring in fashion to identify favored women's long-sleeve shirt designs. A total of 48 female students aged between 18 and 26 years recruited from two separate fashion merchandising courses in a public university located in the Northeast region of the United States. Pictures of forty-two women's long-sleeve shirts were initially collected from the website of a well-known fast fashion brand by the researchers.

Various designed long-sleeve shirts were chosen while colors were limited to black and white. Using a 0% to 100% scale with 100% being absolutely to own, students were asked to indicate how much they like to own each of the 42 selected items. Based on the survey responses, five most favored items and 10 least favored items were chosen and used as visual stimuli for the ERP experiment. A convenience sample of 26 female participants aged between 19 and 25 years was recruited for the ERP experiment from a senior fashion merchandising course at the university. The researchers obtained the IRB approval from the university. All participants had normal or corrected-to-normal vision, and reported no neurological abnormality.

Stimuli & Procedures A total of 15 women's long sleeve shirt pictures (5 most favored, 10 least favored) were used as the ERP experiment stimuli. The chosen shirts were presented on cream-colored background. An oddball paradigm was used in which target stimuli (5 favored shirts) and non-target stimuli (10 least favored shirts) were randomly presented. The target stimuli were shown 40 times while the non-target stimuli were presented 160 times. The duration of each stimulus was 500 ms and the interval between the stimuli was randomly varied between 1500 and 2000 ms. A blank screen was displayed during the interval. Before the experiment, participants performed a sample task for familiarization with the ERP experiment. EEG was recorded using a 21-channel electrode cap according to the International 10-20 Electrode system. All electrodes impedances were maintained below 5 k Ω . All EEG activity was recorded by the NeXus-32 system (Mind Media Inc.) with a bandpass of 0.1-40 Hz at a sampling rate of 512 per second.

Grand-averaged ERP waveforms for the five most favored shirts and the 10 least favored shirts were derived and analyzed from the following three electrode sites – FZ, CZ, PZ (See Figure 1 for raw ERP waveforms). The results of ANOVA revealed significant differences were found at CZ ($F_{1,50} = 4.362, p < .05$) and PZ ($F_{1,50} = 4.343, p < .05$) within a 250-300 ms time window (P3). Significant differences were also found at PZ ($F_{1,50} = 5.750, p < .05$) within a 500-600 ms time window (LPP). Overall, the favored shirts produced more enhanced ERP amplitude at the FZ, CZ, and PZ site than the less favored shirts supporting the hypothesis. As this results show, the P3 and LPP components can be evoked by emotional visual stimuli. More positive-going ERP waves are associated with favorable and pleasant responses to the visual stimuli. Apparel companies would be able to utilize this ERP technique especially the P3 and LPP component to verify consumer preferences.

Figure 1. Raw ERP waveforms at FZ, CZ, and PZ



References available upon request*